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ANIMAL BEHAVIOR

Mind in Animals.—Many experimentalists have said in their haste that all comparative psychologists are liars; that comparative psychology has no existence. To the experimental student of animal behavior, working by the methods of physiology and zoology, “psychic factors” are merely an irritating *x*, something which he can not perceive in his work, yet which the philistine is continually trying to force upon him as the cause of what he does perceive. Finding objective determining factors for all the objective phenomena, he has no use for the psychic factors, and finally decides to make war upon the whole worthless mess; Down with comparative psychology! is his cry.

But it is really only as a technician, intent on the proper methods for his own work, that the experimentalist can object to comparative psychology. As soon as he takes a wider view, he must perceive that another group of men have made a life specialty of precisely the matters that he leaves out of account, and he can not expect these men to give up their interest in the distribution and development of the phenomena that they are studying—of mind and mental processes. And so we have here two recent scientific works dealing with the presence of mind in animals, both from the experimental standpoint, one by a psychologist,¹ the other by a zoologist.²

Miss Washburn's book is of the greatest interest and value, supplying a need much felt. It will be the standard work for those who wish to know the present position of scientific animal psychology. Concerning the behavior of animals a large body of verifiable facts, which have begun to shape themselves into a more or less intelligible system, has been gathered together by experimentalists, but the latter have given little but hostile attention to the psychic aspects of the matter. What are the implications of this body of facts concerning the distribution of psychic processes among animals? This is the problem which Miss Washburn sets herself—a problem in which doubtless full as many are interested as in behavior as a purely objective

¹ Washburn, Margaret F. *The Animal Mind: A Text-book of Comparative Psychology*. New York, The Macmillan Co., 1908. \$1.60. (Volume 2 of the *Animal Behavior Series*, edited by R. M. Yerkes.)

² Strassen, Otto Zur. *Die neuere Tierpsychologie*. Vortrag in der zweiten allgemeinen Sitzung der 79. Versammlung deutscher Naturforscher und Aerzte zu Dresden (1907). Leipzig und Berlin, B. G. Teubner, 1908.

science. One need not hold that psychic factors are required for explanation of the objective facts in order to see the great interest of this inquiry.

The author therefore examines systematically the behavior of animals, as discovered by experiment, from *Amœba* to the apes, attempting to show what psychic processes are, or may be, implied. She readily admits the possibility that no psychic processes are present at all; but the question is this: If we assume that psychic processes *are* present, and that they follow rules like those which they follow in man, then what ones appear to be present in the different groups of animals? In answering this question, the principle of parsimony is taken as a guide: "in no case may we interpret an action as the exercise of a higher psychological faculty, if it can be interpreted as the outcome of the exercise of one which stands lower in the psychological scale." The undeniable dangers of this, in the evident fact that nature doesn't always operate by what seems to our limited view the simplest means, is expressly recognized, but the principle is thought valuable for holding in check the common tendency to attribute higher intellectual faculties to animals—a tendency, we may remark, which in very recent times shows some inclination to change into its opposite.

After judicious introductory chapters on Difficulties and Methods; on the Evidences of Mind, and on Mind in the Simplest Animals, the main divisions of the book are devoted to Sensory Discrimination; Spatially Determined Reactions; Modification by Experience; the Memory Idea, and Attention. The devotee of popular animal psychology will be surprised to find that the word *reason* does not even occur in the index. The facts of behavior are set forth clearly and accurately; the student even of the strictly objective aspects of the subject will find this perhaps the best compendium of the important facts that exists. The treatment is throughout sane and conservative; it is analytic, systematic and scientific—not in any sense popular, though clear. Slips as to facts and details appear to be rare. All together the treatment appears to one not a psychologist—to one who "wants to be shown"—most satisfactory. Such a discussion of these matters by a competent psychologist has been much needed.

The book gives the experimentalist an opportunity to compare as to solidity and general satisfactoriness, his own objective

science, built up by systematizing the verifiable facts alone, with that which searches for the psychic processes underneath what is observed. The difficulties of making a positive science from the unverifiable psychic implications of the actions of animals is well illustrated by the conditional and potential forms in which the author is forced throughout to clothe her statements. Thus, in discussing the psychic aspect of orientation to light (p. 184), the predicates of six successive sentences are: we "cannot imagine"; we "may conjecture"; "is the human experience most closely resembling"; "appears to be"; "may have"; it "is possible that." The experimentalist becomes convinced more than ever of the need of building up his own positive science of behavior, composed of verifiable propositions, and omitting psychic factors—though there is no reason why he should look with an unfriendly eye on the attempt, as a separate thing, to supply conjecturally the missing psychic elements.

The difficulties in preparing a satisfactory account of the animal mind are further increased by the high degree in which the experimental science of behavior shares the provisional and uncompleted character of all science. Animal behavior even as a purely objective science is merely in its beginning. No greater mistake could be made (and this our author evidently recognizes) than to suppose that our present experimental knowledge is sufficient for defining sharply the psychic powers of animals. It is quite possible that the picture of the mind of one of the higher animals that might be drawn by an observing and judicious dog lover would be much more adequate than the rude sketch which experimental science is now able to give us. The material furnished by the old Anecdotal School, and by the Lovers of Nature, doubtless contains much most-important truth, to which the experimental method has not yet succeeded in attaining: only, as Miss Washburn says, it is not possible to tell what *is* true, what false. This material furnishes valuable finger posts for experimental investigation, but if we are ever to be able to distinguish the true from the false in animal behavior, it is necessary to build up the science by that slow and painful addition of one verifiable fact to another, which has proved the method of advance for other sciences. At any given time then our experimental science and the psychology based upon it are bound to be incomplete and inadequate to the reality. A single illustration must suffice. Miss Washburn shows that a careful

analysis of the experimental facts indicate that in Crustacea there is no color vision. But in the short period since her account was written, Minkiewicz has demonstrated experimentally a refined color vision in this group, the animals standing with much success the test of "matching colors" for their disguises. If in so comparatively simple a matter the negative indications were wrong, how much dependence can be placed on our now having a complete knowledge of what exists in higher spheres? Every experimenter knows how near he came to missing some important result that he finally reached; he realizes that there are doubtless many things equally important that he *did* miss. The positive results of experimental science are stones for building; the negative ones are often merely space as yet unfilled. Yet such summaries as Miss Washburn gives us of the knowledge at any particular time are necessary and valuable, especially when, as in the present case, they are put together by one fully conscious of the limitations of the subject.

Zur Strassen³ in his lecture before the German Congress of Naturalists and Physicians deals with another aspect of mind in animals; with a question of the greatest practical interest to experimentalists, and of great theoretical interest to all. Are "psychic factors" required for explaining the behavior of animals, or can we explain the behavior throughout from the experimentally perceivable, objective, factors; can animals be understood as physico-chemical machines? Zur Strassen follows a course of reasoning which is often begun, but which usually stops in the middle; the author carries it to the end, with illuminating results.

As his guide he takes the principle of parsimony in its widest sense—that we shall not assume the existence of any factor which is not required in order to explain the results. A further principle, acted upon but not set forth in words, is that mere increase of complication, no matter how great, does not in itself imply a new principle of action. Under these principles he examines a series of examples of animal behavior in successive stages of complications, from *Amœba* to apes, concluding in each case that the entire behavior can be understood from the standpoint of physico-chemical causality, and that therefore we are not entitled to assume the presence of any psychic factor in the matter. The author is not inclined to add or subtract from

³ *Loc. cit.*

the facts in order to maintain his thesis; he recognizes fully the complication of the behavior of both higher and lower animals; and he does not claim that we now know the precise physico-chemical factors involved in all behavior. But he is able to make a good case for his view that all is fundamentally intelligible physico-chemically; in other words, that we could ultimately make a complete and systematic explanation of what animals do, even if we assumed that they have no "psychic factors," no consciousness, at all. The nature of the objective explanations which to the author seem satisfactory he can of course merely sketch; there is no attempt to give details or claim finality. Most significant appears to him, as to others who have studied the matter, the making by animals of varied movements, which bring them into varied relations with the environment, until certain of these relations prove advantageous and therefore persist. To this way of acting, which has received various names, including (from the present reviewer) the unfortunately misunderstood one of "method of trial and error," Zur Strassen gives the expressive name of the "shot-gun method." Some such evidently figurative term is doubtless its best appellation, as reducing the temptation to read higher things into it.

But now we come to the case of man; do our principles of interpretation exclude psychic factors here also? Most undoubtedly they do, if the reasoning up to this point has been well based. Greater complication there is, but no difference in principle; Zur Strassen sets forth that there is no reasonable ground for making a distinction between the behavior of man and that of animals in this matter. And so, are we led to the absurd conclusion that there are no psychic processes, no consciousness, in man?

Here we perceive that two questions must be distinguished—two questions which we shall try to formulate even more sharply than the author has done, because the usual failure to distinguish them has tremendously confused this whole matter. The questions are: (1) Does mind exist in men and animals? (2) Does mind play such a part in the behavior of men and animals that a complete objective explanation of the behavior can not be given without taking it into consideration?

To this second question Zur Strassen answers, No: a satisfactory explanation of the behavior of man and animals can be given without taking into consideration any factors but objective,

physico-chemical ones. But this has no bearing on the answer to the *first* question: it is no argument against the *existence* of mind in either man or animals, for it does exist in man. It may therefore exist in animals: the author concludes, as he is bound to, that the probability is that men and animals are alike in this matter; that animals also are conscious. His only contention is that mind is not a *factor* in determining objective behavior; or as the reviewer would prefer to put it, that a complete objective explanation of behavior can be given without taking into consideration consciousness.

Zur Strassen's discussion brings out two points that much need recognition. (1) If we adopt the principle of parsimony of explanation as a test for the *existence* of psychic qualities, as has been done by various authors, we inevitably come to the result that such qualities do not exist, even in places where we know, by direct experience, that they do exist. When I withdraw my burned finger from the flame, consciousness is no more required for an objective explanation of this action than it is for the withdrawal of *Amœba* under similar conditions, yet in my case there *is* consciousness, of a very intense character. Therefore the result of the application of this principle of parsimony is no test whatever for the existence of psychic qualities. A consistent carrying through of the principle places man and animals in the same category, and is therefore, as Zur Strassen maintains, rather favorable than otherwise, to the general distribution of consciousness in animals.

(2) Admission of the existence of consciousness in animals is not equivalent to holding that consideration of this consciousness is required for a complete objective explanation of behavior. This point needs to be sharply realized. Look at the matter experimentally. A complete explanation, from an experimental point of view, is one in which the preceding condition is shown to contain differential factors for determining all the differentiations of the succeeding condition. The question whether consciousness is a "factor" requiring consideration in objective explanations resolves itself experimentally into this: Do we sometimes, in analytical experimentation, come to situations where there are no differences in experimentally perceivable factors to account for differences in our results? If we could perceive accurately all the objective factors present, should we find that sometimes two identical combinations give different

results? If so we might be compelled to conclude that some factor *x*, not perceivable objectively—a psychic factor, perhaps—is playing a part. And this of course would mean the bankruptcy of the experimental method; it would mean that things happen which are not determined, so far as experiment can show; that when differing results appear in two cases, we cannot look with confidence for any antecedent differences in the conditions to explain them; that by supplying the same conditions in two cases we can not be sure of getting the same results; it would mean that nature plays fast and loose with us so far as objective experimentation is concerned. To the experimentalist the question whether states of consciousness may at times come in and alter his results, without the accompaniment of changed objective conditions to which the changed results can be attributed, is evidently an intensely practical one, and so long as this possibility is held open, it is idle to tell the experimenter that he should not concern himself about psychic processes.

But if, as is commonly held, states of consciousness are always accompanied by objective physiological conditions, and these objective conditions differ when the conscious states differ, then of course we should always be able to find satisfactory objective determining factors for all differing results; a complete experimental explanation of what happens could be given, without taking into consideration unknown states of consciousness; the objective experimental method would be reliable. There seems to be no convincing evidence as yet that it is not reliable and sufficient unto itself; it will be best to hold to it till such evidence appears. And yet, as we have seen, to hold to it as reliable and sufficient does not imply in the least that states of consciousness do not likewise exist.¹ Comparative psychology and a purely objective science of animal behavior, complete in itself, may exist side by side without the least conflict.

H. S. JENNINGS.

¹ It does not even imply, I believe, that consciousness is without effect on action. A good case could be made for the effectiveness of consciousness, in a widened experimental sense, even though a purely objective explanation, without gaps, can be given for behavior.